

Conservative Management without Colonic Resection: A definitive Treatment for Complicated Left Side Diverticulitis?

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ABSTRACT

Management of complicated colonic diverticular disease is still controversial. The aim of this study is to evaluate the efficacy and safety of the conservative management in complicated acute diverticulitis patients. This is a retrospective study of 44 patients with hemodynamic stability and CT evidence of extra digestive air and/or abscess without evidence of generalized peritonitis [median age: 58 years (range 34-88); 18 females (40.9%)]. The conservative measures included nil per os (NPO), intravenous fluids and antibiotics. CT-guided percutaneous aspiration with drain or laparoscopic drainage was done in some patients. Forty patients (90.9%) were managed without any surgical intervention. Thirty six (81.8%) patients of them were managed even without guided aspiration or laparoscopic drainage. We concluded that conservative policy is feasible and safe in management of complicated acute diverticulitis patients with a low recurrence risk.

Keywords: *Complicated diverticulitis, conservative management.*

INTRODUCTION

Diverticular disease of the colon is an important cause of hospital admissions and a significant contributor to healthcare costs in Western and industrialized societies^(1, 2). The prevalence of diverticulosis is age-dependent, increasing from less than 20 percent at age 40 to 60 percent by age 60^(3,4).

The prevalence rates of diverticulosis varies by geography; Western and industrialized nations have prevalence rates of 5 to 45 percent, depending upon the method of diagnosis and age of the population^(5, 6). In Asia, the prevalence of diverticulosis is between 13 and 25 percent^(7, 8).

Approximately 95 percent of patients with diverticula have sigmoid diverticula. Diverticula are limited to the sigmoid colon in 65 percent of patients. Although a male preponderance was noted in early series, subsequent studies have suggested either equal distribution or a female preponderance⁽⁹⁾. The prevalence of diverticulosis has increased both in the Western hemisphere and in countries that have adopted a more Western lifestyle^(10, 11). Approximately 4 to 15 percent of patients with diverticulosis develop diverticulitis^(12, 13).

The incidence of diverticulitis is increasing. An inpatient study of hospitalizations in the United States showed an increase in admissions for acute diverticulitis by 26 percent from 1998 to

2005. The largest increase was in patients aged 18 to 44 years (82 percent). Elective operations for diverticulitis also increased by 29 percent with the largest increase in patients aged 18 to 44 years (73 percent). The incidence of diverticulitis increases with age. The mean age at admission for acute diverticulitis is 63 years⁽¹⁴⁾.

While the incidence of acute diverticulitis is lower in younger individuals, approximately 16 percent of admissions for acute diverticulitis are in patients under 45 years of age⁽¹⁵⁾.

The underlying cause of diverticulitis is micro- or macroscopic perforation of a diverticulum. It is believed that obstruction of diverticula (eg, by fecaliths) increased diverticular pressure and caused perforation⁽¹⁶⁾.

Acute diverticulitis is usually graded as 'uncomplicated' or 'complicated' according to the classification of the European Association for Endoscopic Surgery⁽¹⁷⁾, as 'mild' or 'severe' according to the Ambrosetti computed tomography (CT) criteria⁽¹⁸⁾, or the modified Hinchey classification⁽¹⁹⁾: type 1 and type 2 refer to paracolic abscesses, while type 3 and 4 refer to purulent and fecal peritonitis, respectively.

The American Society of Colon and Rectum Surgeons revised its practice parameters for sigmoid diverticulitis in 2006 and stated that "elective colon resection should typically be advised if an episode of complicated diverticulitis is treated nonoperatively"⁽²⁰⁾.

On contrast, some authors reported management using a conservative policy. Myers *et al*⁽²¹⁾, reported 92 patients with Hinchey peritonitis managed by laparoscopic peritoneal lavage only. Two patients only re-presented with diverticulitis at a median follow-up of 36 months (range 12-84).

Aim of the study is evaluate the safety and efficacy of the conservative management without colonic resection in patients with complicated left side diverticulitis and if it could be a definitive treatment for these patients.

PATIENTS AND METHODS

This is a retrospective study of complicated left colon diverticulitis patients admitted in Hai Aljameaa hospital (private hospital in Jeddah, Kingdom of Saudi Arabia) and Kasr alainy hospital faculty of medicine Cairo university between June 2013 and June 2015 and managed by conservative measures. They were diagnosed on pelvi-abdominal CT scan with intravenous and oral contrast by the presence of a paracolic collection, air or pelvic abscess. This classification was based on the definition used by Ambrosetti *et al*⁽¹⁸⁾.

The conservative measures included NPO, intravenous fluids and antibiotics (cefotaxime (1 g three times daily) and metronidazole (500 mg three times daily) for a minimum of three days, then replaced by oral antibiotics for one week. If there was no improvement based on clinical, laboratory and radiological parameters, CT-guided percutaneous aspiration with drain insertion was done by radiologists. Laparoscopic drainage of collection was done with peritoneal lavage without further colonic dissection to those who were not accessible for the radiologists.

The response to conservative measures was assessed by the following criteria: Abdominal pain and tenderness, vital signs (fever, heart rate,

blood pressure and respiratory rate), toleration of the oral intake, leucocytic count and C-reactive protein. We considered the conservative measures failed if the abdominal pain and/or the tenderness not improved or increased and if the systemic inflammatory response syndrome Criteria are persistent (temperature > 38 °C, heart rate > 90 beats per minute, respiratory rate > 20 breaths per minute or leucocytes > 12000 cells/mm³)⁽²²⁾.

Accordingly we considered the conservative management successful if the previous parameters improved and the patient did not need surgical colonic resection during his hospital stay or during the follow up period.

Repeated pelvi-abdominal CT scan with contrast was done for patients with failed conservative measures. Treatment failure was defined as the need for emergency surgery. Recurrent symptoms during admission, CT guided aspiration with drain or laparoscopic drainage with lavage of intra-abdominal abscess(es) were not considered as failure of the conservative management. Recurrence was defined as recurrence of symptoms more than one month after discharge.

The data of the patients with numbers are summarized in (Figure 1). Follow up by colonoscopy was done for the patients two to six weeks after discharge. Patients managed conservatively and did not come for follow up visits were contacted by telephone during the follow up period. The abdominal pain, recurrences and elective surgeries were analyzed.

The data was presented either as median (min. - max.) or mean (\pm SD). Multivariate analysis and logistic regression to assess any relative risk could not be performed due to the small number of patients per group. A *P* value was considered significant if it is ≤ 0.05 . Statistical analyses were performed using SPSS 13.0 (SPSS, Inc., Chicago, IL, United States).

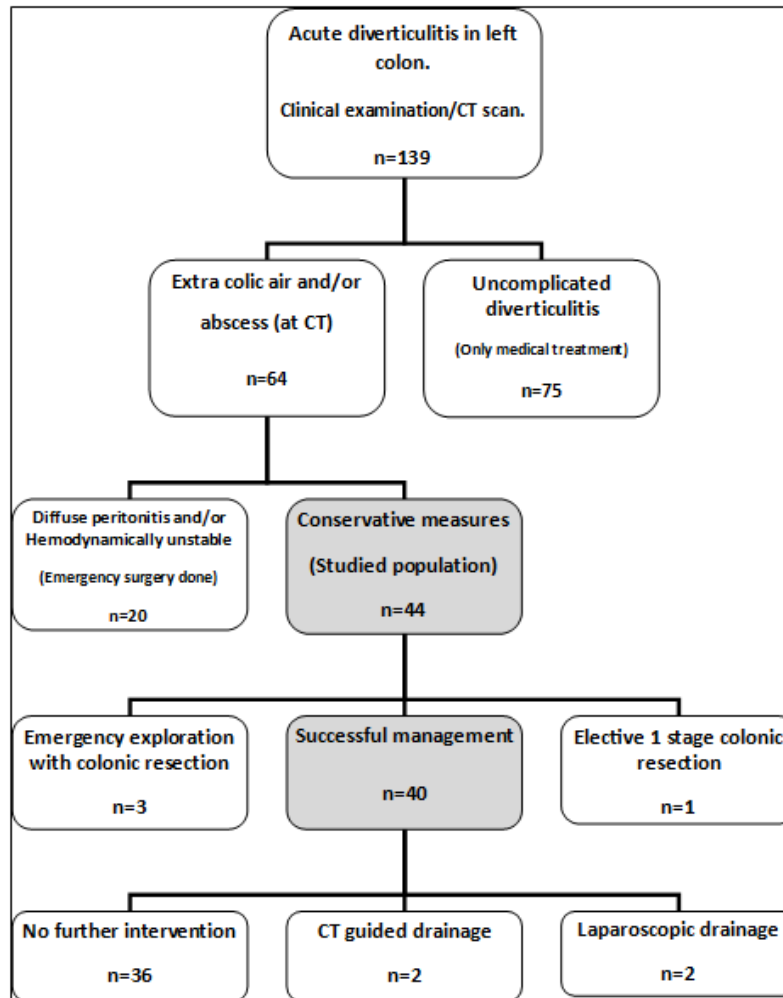


Figure 1: Data of the patients with numbers and outcome.

RESULTS

This study included 139 patients with acute diverticulitis of left colon (Figure 1). Seventy five patients had uncomplicated diverticulitis. The remaining 64 patients had CT evidence of complications, 20 patients of them were excluded because they underwent immediate surgery due to hemodynamic instability and/or generalized peritonitis. The remaining 44 patients (studied population) were hemodynamically stable and had CT evidence of extra digestive air and/or abscess without evidence of generalized peritonitis [median age: 58 years (range 34-88); 18 females (40.9%)]. It was the first attack of diverticulitis

for 39 patients (88.6%), and the remaining patients had one or more previous attack of diverticulitis (Table 1).

The CT findings of the patients are summarized in (Figure 2). Twenty-three patients had evidence of extra colic abscess formation, a paracolic abscess (20 cases) or a pelvic abscess (3 cases). Thirteen patients had evidence of extraluminal air. In 8 cases, both abscess and extraluminal air were present.

Two patients had CT guided percutaneous aspiration with drain of a large abscess and 2 patients required laparoscopic drainage with peritoneal lavage.

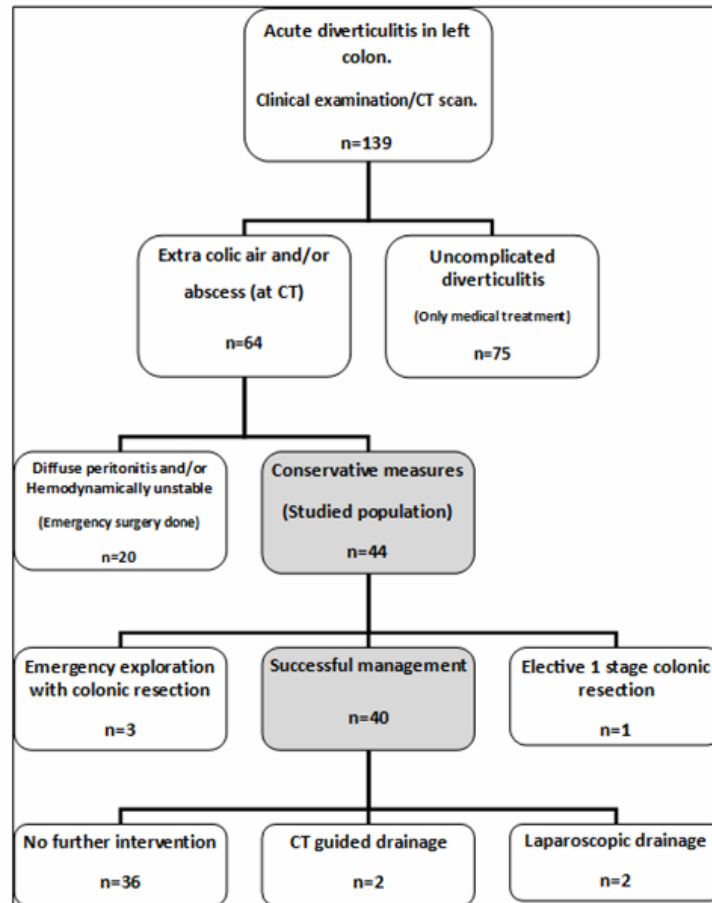


Figure 2: The CT findings of the patients with numbers.

Three patients (6.8%) required intervention for failure of conservative therapy during their admission (Resection with Hartmann's procedure: $n = 2$, resection and colorectal anastomosis: $n = 1$). Indications for emergency colectomy included generalized peritonitis ($n = 2$) on the CT and persistent pain and fevers ($n = 1$). Median time to emergency colectomy was 5 days (range, 3-7).

The median length of hospital stay was 6 days (range, 3-17). One patient underwent elective sigmoid resection 4 months later due to persisting symptoms and recurrent attacks of diverticulitis.

Of the 40 patients who were discharged without emergency or elective resection, 2 patients underwent CT guided abscess aspiration

with drains and 2 patients underwent laparoscopic drainage with peritoneal lavage (Table 1).

Medical examination and colonoscopy were done for all patients in this study two to six weeks after discharge. All these patients were contacted after a median follow-up of 11 months (range, 4-17). In total, 40 patients (90.9%) were managed without any surgical colonic resection during admission or during the follow up period. Of them 36 (81.8%) patients were managed even without guided aspiration or laparoscopic drainage. One patient died during this time due to unrelated cause. Three patients (7.5%) only developed a recurrent attack of diverticulitis without hospitalization (Table 1).

Table 1: Characteristics and results of the patients.

<i>Characteristics</i>	<i>Only abscess n=23</i>	<i>Only extra colic air n=13</i>	<i>Both air and abscess n=8</i>	<i>P value</i>
Number of females	10	5	3	0.25
Mean age	59.43	54.65	58.05	0.18
Number of patients less than 60 years old	11	5	4	0.36
Median length of hospital stay (days)	6	4	8	1.53
Number of previous attacks of diverticulitis	3	1	1	0.28
Leukocytes (cells/mm)	14408(±4155)	12382(±2512)	14206(±5713)	0.44
C-reactive protein mg/L	174.6(±68.4)	128.4(±32)	153.8(±86.3)	0.23
Conservative medical treatment	18	13	5	0.73
Number of patients underwent CT guided aspiration	1	0	1	0.26
Number of patients underwent laparoscopic drainage	2	0	0	0.56
Number of patients underwent colonic resection during first hospital admission	1	0	2	0.87
Number of patients underwent later surgical intervention	1	0	0	1,02
Recurrence	1	0	2	0.87

DISCUSSION

The clinical presentation of sigmoid diverticulitis as abscess has increased in recent years ⁽²³⁾. The optimal treatment of complicated acute diverticulitis is an area in evolution, active research and is still a matter of debate between recurrence risk and failure of conservation on one hand with morbidities and mortalities on the other hand ⁽²⁴⁾.

Some authors perform elective resection after complicated acute diverticulitis to avoid the risk of recurrence and further complications ^(25, 26). However, recent studies have highlighted the fact that an episode of severe diverticulitis may result in a buttressing effect around the affected portion of the colon, thereby protecting it from subsequent attacks ⁽²⁷⁾.

Less than 10% of patients who develop acute diverticulitis require emergency surgery ⁽²⁸⁾. The operative treatment of acute diverticulitis is based on the severity of the disease according to the Hinchey classification ⁽¹⁹⁾, and it includes antibiotics, computed tomography, or ultrasound-guided percutaneous drainage ⁽²⁹⁾. Laparoscopic peritoneal lavage, laparoscopic or open 1-stage colonic resection with direct anastomosis, and sigmoidectomy with terminal colostomy

(Hartmann procedure) with or without subsequent colostomy reversal ^(30, 31).

The Hartmann procedure has high rates of morbidity (33%) and mortality (19%). Moreover, the procedure requires additional surgery to restore intestinal continuity, which also contributes to the significant increase of morbidity and mortality. One-stage colonic resection and anastomosis, with or without loop ileostomy or colostomy is characterized by significant rates of overall morbidity (29%) and mortality (9%) and requires a second surgical intervention in case of stoma ⁽³²⁾.

In the current study, surgical colonic resection is avoided in 90.9% of complicated acute diverticulitis patients by conservative management including CT-guided percutaneous drainage and laparoscopic drainage with peritoneal lavage in some patients avoiding high rates of morbidity and mortality.

The drawbacks of conservative management is the recurrence rates and even failure. To study recurrence rates and post-operative complications following conservative management of acute diverticulitis, Eglinton *et al* ⁽³³⁾ retrospectively analyzed clinical data from all patients with diverticulitis admitted to their department from 1997 to 2002. Recurrence rates was similar in complicated and non complicated diverticulitis.

Recurrence typically occurred within 12 months of the initial episode.

In the current study, The 40 patients who did not undergo elective surgery for colonic resection, but who continued successful nonoperative treatment, only 3 had recurrence (7.5 %) in the follow up period.

Failure of conservative treatment means the need for emergency colectomy and peritoneal lavage was in three cases with generalized peritonitis persistent fever .two of them were with air and abscess (7%)

Dharmarajan *et al* ⁽²⁵⁾ showed that 93% (25 of 27) of their acute diverticulitis patients who presented with stable examination results, and distant free air on computed tomography, were successfully managed without urgent surgery, with 37% of these patients receiving percutaneous drains.

Ambrosetti *et al* ⁽³⁴⁾ conducted a study of 73 cases of diverticular abscesses with 43-months of follow-up. They found that 58% of patients with a mesocolic abscess who had received successful nonoperative treatment during their first hospitalization did not require operative treatment. The authors concluded that a mesocolic abscess by itself is not an absolute indication for colectomy.

Costi *et al* ⁽³⁵⁾ reported a 92.3% (36 of 39) success rate for nonoperative management in patients with diverticulitis and a pneumoperitoneum, excluding those with hemodynamic instability and/or diffuse extravasation of rectal contrast on computed tomography.

These results are nearly similar to this study results as 40 of 44 patients (90.9%) were managed without any colonic resection. Thirty six patients (81.8%) were managed successfully without any intervention even without radiology guided aspiration or laparoscopic drainage.

Gaertner *et al* ⁽³⁶⁾ reported 32 patients that received percutaneous drainage of diverticular abscess without subsequent colectomy, with a recurrence free survival of 58% at 7.4 years. In this study, The two patients who were managed conservatively with CT guided abscess percutaneous aspiration with drain did not have any recurrence of symptoms in the follow up period.

In 1996, O'Sullivan *et al* ⁽³⁷⁾ proposed laparoscopic peritoneal lavage as an alternative to

colonic resection in patients with purulent peritonitis secondary to diverticular perforation. The expected benefit of this minimally invasive approach was an avoidance of urgent laparotomy and colostomy, and a reduction in morbidity and mortality. even in case of treatment failure, the significantly reduced intestinal inflammatory environment after peritoneal lavage would be expected to minimize complications from a subsequent sigmoid resection. This approach has gained a wide interest, and many surgeons have reported it in their series ⁽³⁸⁻⁴⁰⁾.

Some authors advocate adhesiolysis in order to debride and drain any localized peritonitis or abscess ^(41, 42). Other authors prefer to leave the colon untouched in order to preserve an eventual sealed perforation ^(43, 44).

In our study, in the 2 patients who managed by laparoscopic drainage of the abscess with peritoneal lavage, the colon was not touched and no trial was done for adhesiolysis, debridement or explorative drilling in order to preserve an eventual sealed perforation. These 2 patients did not have any recurrence of symptoms in the follow up period.

CONCLUSION

Conservative management is a successful policy in managing complicated diverticulitis. Elective colectomy could be limited to treat rare patients with complications or recurrent and disabling bouts of diverticulitis. Incidence of elective surgery required after such conservative treatment 2.5% (one patient in the current study) but this needs more follow up period .Failure of conservative management was in group of patients with abscess and air in CT (5%). Furthermore, selection criteria for nonoperative management were not standardized. These data provides valuable insight into the natural history of complicated diverticular disease, and might be considered preliminary to a future, multicenter prospective trials to better evaluate this attitude that warrants further confirmation

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Stomach Volume after One Month of Gastric Plication for Treatment of Morbid Obesity

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ABSTRACT

*Laparoscopic gastric plication procedure is still under investigations. This study aimed at measuring the stomach volume and configuration after laparoscopic gastric plication using CT. **Methods** : Ten morbidly obese patients underwent gastric plication and were followed up after one month regarding excess weight loss and stomach size and configuration as measured using CT volumetry. **Results** : Median preoperative Body Mass Index (BMI) was 50.8. Median excess body weight loss (EBWL) was 23% after one month (EBWL1), Median pouch volume was 236 ml after one month (Volume1), Study also showed pouching of the fundus due to low lying first stitch in some cases, which allowed the authors to improve their technique and improve the Excess weight loss. **Conclusions**: CT Volumetry will help in assessing the stomach volume and configuration in centres starting the operation, which will help in perfecting the technique.*

Keywords: Hospital, Volumetry, Gastric, Plication, Weight loss.

INTRODUCTION

Laparoscopic gastric plication (LGP) is a relatively new bariatric restrictive procedure that reduces the stomach volume by placing rows of non-absorbable sutures on the gastric wall¹. Initial data show that LGP is effective for short- and medium-term weight loss. Current studies show an Excess weight loss (%EBWL) at the range of 50% on 6 months and 60% on 12 months. Pouch volume after bariatric surgery was found to correlate positively with weight reduction². Talebpour and Amoli estimated the gastric volume at the end of vertical gastric plication to be about 100ml. however, they found that their patients initially tolerated a maximum of about 50ml meals only³. This was a rough estimate and there are no previous attempts at monitoring any changes of size as a result of pouch dilatation over time. Recently, CT volumetry appeared as an accurate means of estimating the gastric capacity⁴. None of the previous studies has measured the gastric volume by an accurate method.

Aim: The aim of the study is to measure the gastric volume after gastric plication accurately using Ct volumetry and add recommendations to improve the operative technique.

PATIENTS AND METHODS

This is a descriptive study included ten morbidly obese patients fulfilling the standard criteria from Cairo University Hospital (CUH) in the period (Aug. 2010 and May. 2011).

Technique

After disconnecting the greater curvature Gastric plication was done by invagination of the greater curvature into the lumen using two rows of sero-muscular non-absorbable 2-0 Ethibond™ poly-filament sutures judged by the apparent external size of the stomach. Plication started 2 cm from the angle of His to 4 cm from the pylorus. Distance of bites from the greater curvature was about 4 cm near the fundus and was gradually diminishing till the pylorus was reached. Distance between bites was 2 cm in the first row and 1 cm in the second rows. The stomach was thus converted into a tubular structure that is based on the lesser curvature. The amount of invagination was guided by a 36-Fr orogastric tube.

Follow up

Weight record and CT volumetry were done at one month after the operation as a measure of the operative volume of the stomach.

Patients Preparation for Ct Volumetry:

Plain abdominal CT was performed on a Multislice CT 64-section detector scanner (GE) (General Electric Medical Systems, Milwaukee, WI, USA). All patients were fasted for at least 8 hours before performing the study. Before the CT examination, two packs of effervescent granules were added to 10 ml of water and administered orally to each patient. Patients were placed on the scanning table in the supine position. A scout projection is then obtained showing the stomach fully distended by gas. If the stomach is inadequately distended, one more pack of effervescent granules was administered orally to ensure adequate distension. A delay of 10 – 15 seconds was needed to ensure complete distention of the stomach.

Ct Protocol:

Images were obtained from a level 1–2 cm below the dome of the diaphragm to the lower pole of the right kidney during a single breath hold. The 1.25-mm transverse CT sections were reconstructed at 0.5-mm intervals, performed at a commercially available workstation. The contours of all stomach sections were traced by means of a built-in cursor. During 3D reconstruction for volumetry in LGP patients, the first section starts roughly at the gastro-esophageal junction. The manufacturer's workstation with a specific software automatically calculated the number of pixels included within the traced contours on each section and provided the cross-sectional area of the stomach on a section-by-section basis. The circumscribed areas were then automatically multiplied by the CT section thickness, yielding an approximate volume for each stomach section, and the volumes of all sections were summed to give the selected stomach volume.

RESULTS

In this case series study median operative time was 160 minutes. Median post-operative hospital stay was 2 days.

BMI was as shown in (table 1). Median Excess body weight loss (EBWL) was 23% after one month (EBWL 1). Median Pouch volume was 236 ml after one month (Volume 1).

CT volumetry has created a three dimensional figure for the stomach, which showed pouching of the fundus in some cases (Figure 2). This was caused by low lying first fundal sutures, which led

to out pouching of the missed fundus. That was probably because of the fear of over-plication of the fundus, which can lead to esophageal obstruction.

Table (1): Summary of Results

	Median	Minimum	Maximum
BMI 0	50.750	34.3	62.0
BMI 1	47	35.0	59.0
Excess weight loss at 1 month (EBWL1)	23%	8.0%	37%
Volume 1 (ML)	236.000	110.0	169.0

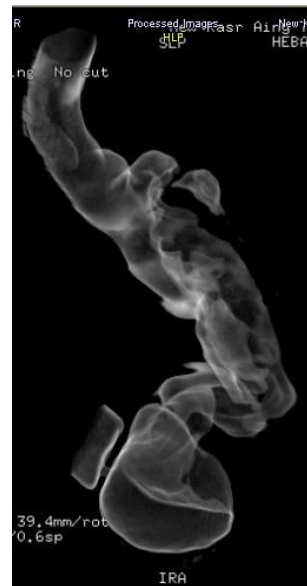


Figure 1: CT Volumetry image showing well plicated stomach

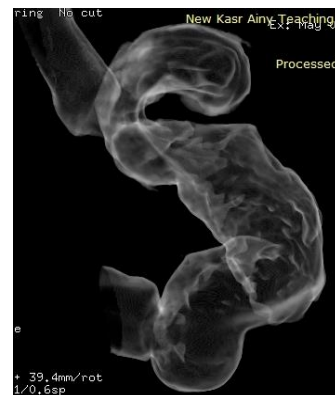


Figure 2: CT Volumetry image showing redundant fundus.

DISCUSSION

In the current study Excess weight loss was 23% after 1 month, which is acceptable range of weight loss in comparison with sleeve gastrectomy and other gastric plication studies. A recent meta-analysis done in 2013 included 11 studies between 2000 and 2012 showed that the excess weight loss 6 months after sleeve gastrectomy was 50.6%¹.

The Median gastric volume was 236 ml at one month. The gastric volume was eventually higher than the volume reported in literature after sleeve gastrectomy although the patients had similar excess weight loss. Talebpour has suggested that muscle contraction in the plicated fold against each other may lead to post-prandial discomfort that leads to functional restriction, which stops patient from eating after 50 ml, which has been observed in gastric plication patients⁵.

We recommend that attention should be paid to the fundus during plication as the missed fundus could be a possible cause of inadequate weight loss. Also close sutures should prevent out pouching, which is a potential cause of complications. We believe that CT Volumetry will help in assessing the stomach volume and configuration in centres starting the operation, which will help in perfecting the technique.

Conclusions and recommendations

- Attention should be paid to the fundus during plication as missing the fundus could be a possible cause of inadequate weight loss.

- Cause of failure could be assessed by using CT Volumetry to assess the stomach configuration and size.

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